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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 974,584	10 09 2001	Shih-Ming Wang	67,200-318	8284

7590

07 08 2003

TUNG & ASSOCIATES

Suite 120

838 W. Long Lake Road

Bloomfield Hills, MI 48302

EXAMINER

PHAM, LONG

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 07 08 2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/974,584

Applicant(s)

WANG ET AL.

Examiner

Long Pham

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_ 6) ☐ Other:

**DETAILED ACTION**

***Rejections and/or objections necessitated by the amendments***

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art (AAPA) of this application in view of Shiromizu (JP '192) and Polinsky (US '059).

AAPA teaches a method for depositing an inter-metal-dielectric (IMD) or oxide layer on a semiconductor substrate by plasma chemical vapor deposition (CVD) comprising the steps of (see the Background of the Invention on pages 1-5 of this present application) :

conducting a plasma CVD process on a semiconductor substrate and depositing said inter-metal-dielectric layer and further comprising a step of flowing precursor gases of silane and nitrous oxide into the plasma CVD chamber for depositing said IMD.

However, AAP fails to teach that the semiconductor substrate is heated to a temperature between 300 and 400 degrees Celsius in the same chamber before the dielectric or oxide layer is formed as recited in present claims 1, 2, 3, 4, 9, and 10.

Shiromizu teaches a process in which the surface of a semiconductor substrate is heated to a temperature higher than 400 degrees Celsius before

a oxide layer is formed on the surface of the substrate. See the English abstract.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to heat the surface of the substrate to a temperature of 401 degrees Celsius or higher than 400 degrees Celsius before forming the oxide layer on the surface of the substrate in the method of AAPA because doing so the undesired organic substance on the surface of the substrate can be removed.

It is noted that the difference in effect of using a temperature of 400 degrees Celsius of claimed invention and a temperature of 401 as taught by Shiromizu is insignificant that the result of heating on the substrate would be basically the same.

AAPA and Shiromizu fail to teach that the surface of the substrate is heated for a period of greater than 30 seconds as recited in present claims 1, 3, and 5.

Polinsky teaches that the surface of a semiconductor substrate is heated before a layer is formed on the substrate surface to prevent cracking. See col. 1, lines 1-20.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal range for the heating time through routine experimentation and optimization to prevent cracking.

3. Claims 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art (AAPA) of this application in view of Shiromizu (JP '192) and Polinsky (US '059).

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AAPA teaches a method for depositing an oxide or inter-metal-dielectric (IMD) layer on a semiconductor wafer comprising the steps of (see the Background of the Invention on pages 1-5 of this present application) : Depositing a silicon oxide layer on said wafer by plasma enhanced CVD and further comprising a step of flowing precursor gases of silane and nitrous oxide into the plasma CVD chamber for depositing said oxide or IMD layer. However, AAP fails to teach that the semiconductor substrate is heated to a temperature between 300 and 400 degrees Celsius in the same chamber before the dielectric or oxide layer is formed as recited in present claims 11, 12, 13, and 14.

Shiromizu teaches a process in which the surface of a semiconductor substrate is heated to a temperature higher than 400 degrees Celsius before a oxide layer is formed on the surface of the substrate. See the English abstract.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to heat the surface of the substrate to a temperature of 401 degrees Celsius or higher than 400 degrees Celsius before forming the oxide layer on the surface of the substrate in the method of AAPA because doing so the undesired organic substance on the surface of the substrate can be removed.

It is noted that the difference in effect of using a temperature of 400 degrees Celsius of claimed invention and a temperature of 401 as taught by Shiromizu is insignificant that the result of heating on the substrate would be basically the same.

AAPA and Shiromizu fail to teach that the surface of the substrate is heated for a period of greater than 30 seconds as recited in present claims 13 and 14.

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Polinsky teaches that the surface of a semiconductor substrate is heated before a layer is formed on the substrate surface to prevent cracking. See col. 1, lines 1-20.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal range for the heating time through routine experimentation and optimization to prevent cracking.

With respect to claim 16, AAPA further teaches the step of cleaning the surface of the substrate or wafer by a nitrous oxide (N<sub>2</sub>O) plasma.

AAPA in view of Shiromizu and Polinsky fails teach maintain the chamber pressure at less than 10<sup>-2</sup> Torr before deposition of the oxide layer as recited in present claim 15.

it would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal range for the chamber pressure before the formation of the oxide layers through routine experimentation and optimization to obtain optimal or desired device performance because the chamber pressure is a result-effective variable and there is no evidence indicating that the chamber pressure is critical or produces any unexpected results and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

#### ***Response to Arguments***

4. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

In response to the applicant's arguments in the paragraph connecting pages 10 and 11, it is submitted the motivation for heating the substrate at 401 degrees

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Celsius before the formation of the oxide layer the surface of the substrate in the method of AAPA is to remove the undesired organic substance on the surface of the substrate. Further it is submitted that the heating temperature of 400 of claimed invention is not patentably distinguished from the temperature of 401 of prior art since the variation of a few degrees does not change the effect relative the wide range of claimed temperature. Further, Polinsky teaches that the surface of a semiconductor substrate is heated before a layer is formed on the substrate surface to prevent cracking, It would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the heating time of the substrate that allows prevention of the cracking.

#### ***Conclusion***

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

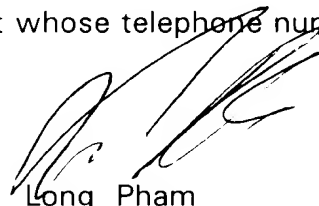
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 703-308-1092. The examiner can normally be reached on M-F, 8:30AM-5:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-746-4082 for regular communications and 703-746-4082 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Long Pham

Primary Examiner

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L. P.

July 5, 2003